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A Practical Road to SaaS' in Python

Hi, I'm Armin

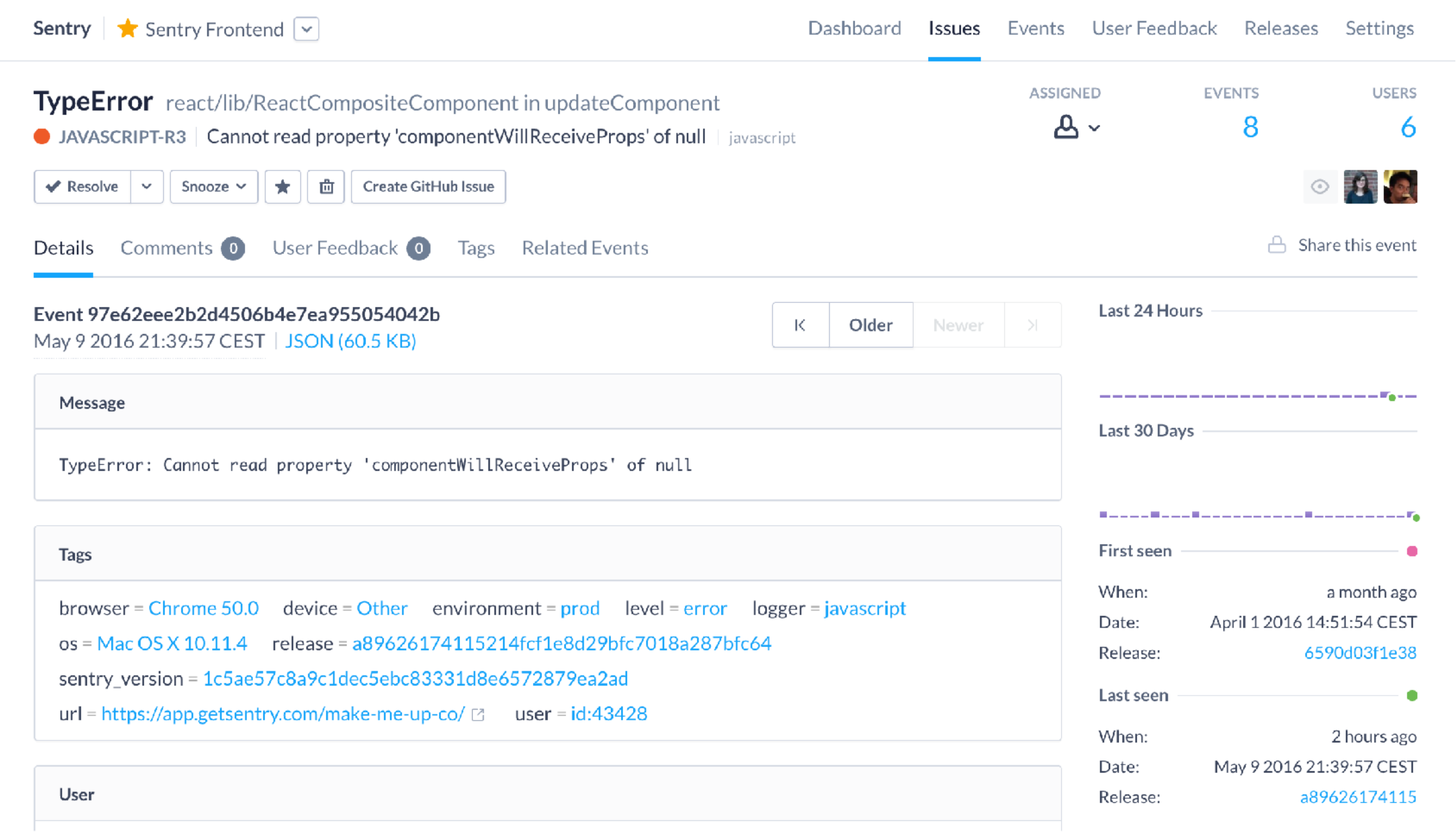
… and I do Open Source, lots of Python and SaaS

Flask
Sentry
…

Flask

web development,
one drop at a time

SENTRY



TypeError react/lib/ReactCompositeComponent in updateComponent

JAVASCRIPT-R3 | Cannot read property 'componentWillReceiveProps' of null | javascript

Event 97e62eee2b2d4506b4e7ea955054042b

May 9 2016 21:39:57 CEST | JSON (60.5 KB)

Message

```
TypeError: Cannot read property 'componentWillReceiveProps' of null
```

Tags

browser = Chrome 50.0 device = Other environment = prod level = error logger = javascript

os = Mac OS X 10.11.4 release = a89626174115214fcf1e8d29bfc7018a287bfc64

sentry_version = 1c5ae57c8a9c1dec5ebc83331d8e6572879ea2ad

url = https://app.getsentry.com/make-me-up-co/ user = id:43428

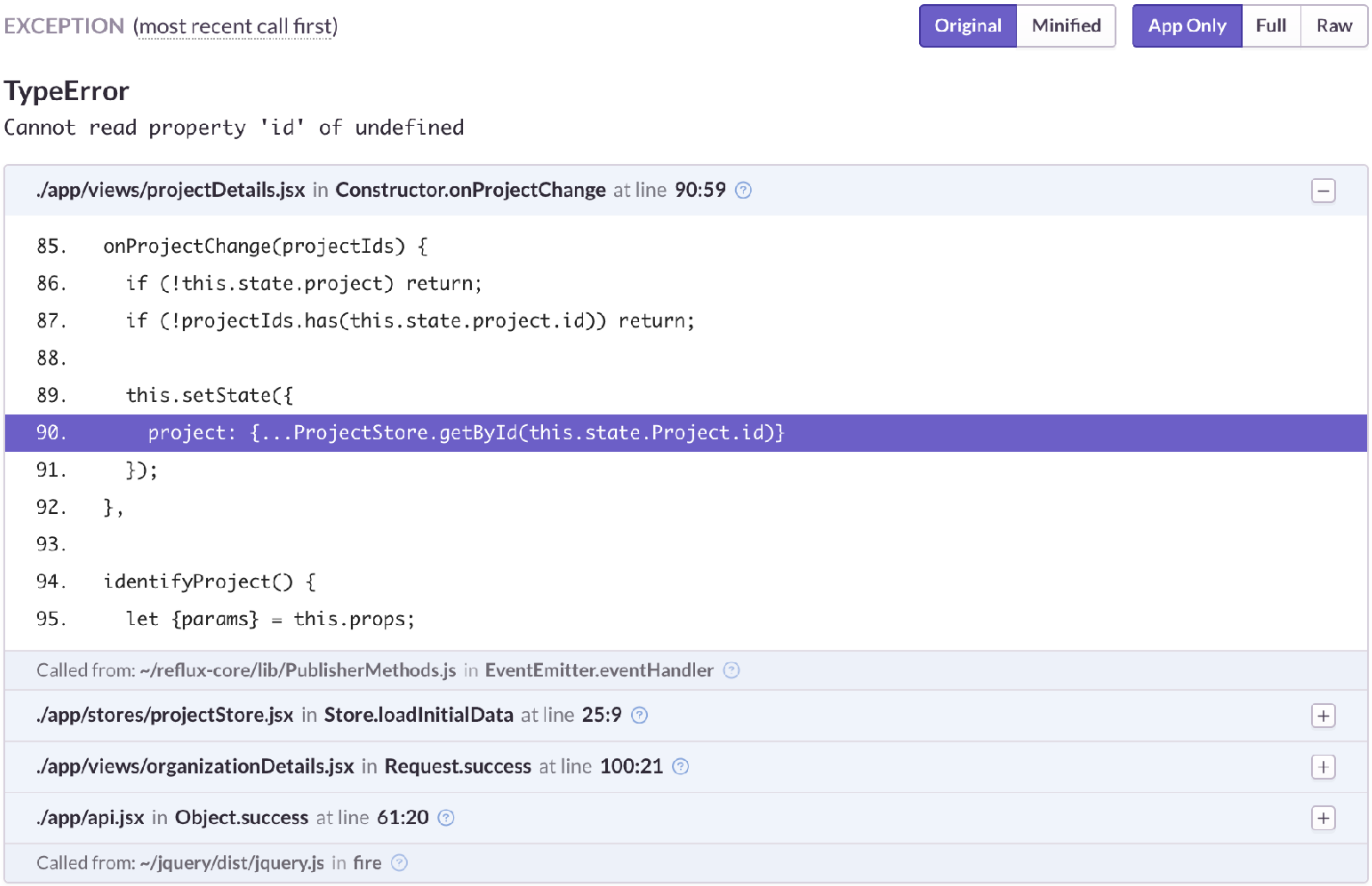
User

First seen

When:	a month ago
Date:	April 1 2016 14:51:54 CEST
Release:	6590d03f1e38

Last seen

When:	2 hours ago
Date:	May 9 2016 21:39:57 CEST
Release:	a89626174115



EXCEPTION (most recent call first)

TypeError

Cannot read property 'id' of undefined

./app/views/projectDetails.jsx in **Constructor.onProjectChange** at line **90:59**

```
85.   onProjectChange(projectIds) {
86.     if (!this.state.project) return;
87.     if (!projectIds.has(this.state.project.id)) return;
88.
89.     this.setState({
90.       project: {...ProjectStore.getById(this.state.Project.id)}
91.     });
92.   },
93.
94.   identifyProject() {
95.     let {params} = this.props;
```

Called from: ~/reflux-core/lib/PublisherMethods.js in EventEmitter.eventHandler

./app/stores/projectStore.jsx in **Store.loadInitialData** at line **25:9**

./app/views/organizationDetails.jsx in **Request.success** at line **100:21**

./app/api.jsx in **Object.success** at line **61:20**

Called from: ~/jquery/dist/jquery.js in fire

I love Open Source

Therefore I love SaaS

SaaS

Multi Tenant

But also …

On Premises?

MANAGED CLOUD?

Python

Why Python?

Python in 2017

STRONG ECOSYSTEM

Fast Iteration

Stable Environment

Powerful Metaprogramming

Fast
Interpreter
Introspection

Quo Vadis?

Python 2.7 / 3.6

Machine Learning

The Foundation

Flask

web development,
one drop at a time

django

aiohttp

roll your own?

Application Architecture

Security First

patterns are universal

examples are Flask + Flask-SQLAlchemy

If you only take one thing away from this talk …

Context Awareness

… or how I learned to love the thread-local bomb

Tenant Isolation

```
from flask import g, request

def get_tenant_from_request():
    auth = validate_auth(request.headers.get('Authorization'))
    return Tenant.query.get(auth.tenant_id)

def get_current_tenant():
    rv = getattr(g, 'current_tenant', None)
    if rv is None:
        rv = get_tenant_from_request()
        g.current_tenant = rv
    return rv
```

Automatic Tenant Scoping

```python
def batch_update_projects(ids, changes):
    projects = Project.query.filter(
        Project.id.in_(ids) &
        Project.status != ProjectStatus.INVISIBLE
    )
    for project in projects:
        update_project(project, changes)
```

DANGER!

Automatic Tenant Scoping

```python
class TenantQuery(db.Query):
    current_tenant_constrained = True
    def tenant_unconstrained_unsafe(self):
        rv = self._clone()
        rv.current_tenant_constrained = False
        return rv

@db.event.listens_for(TenantQuery, 'before_compile', retval=True)
def ensure_tenant_constrainted(query):
    for desc in query.column_descriptions:
        if hasattr(desc['type'], 'tenant') and \
           query.current_tenant_constrained:
            query = query.filter_by(tenant=get_current_tenant())
    return query
```

Automatic Tenant Scoping

```python
from sqlalchemy.ext.declarative import declared_attr

class TenantBoundMixin(object):
    query_class = TenantQuery

    @declared_attr
    def tenant_id(cls):
        return db.Column(db.Integer, db.ForeignKey('tenant.id'))

    @declared_attr
    def tenant(cls):
        return db.relationship(Tenant, uselist=False)
```

Example Use

```python
class Project(TenantBoundMixin, db.Model):
    id = db.Column(db.Integer, primary_key=True)
    name = db.Column(db.String(100))
    status = db.Column(db.Integer)

    def __repr__(self):
        return '<Project name=%r>' % self.name
```

```
>>> test.Project.query.all()
[<Project name='project42'>]
>>> test.Project.query.tenant_unconstrained_unsafe().all()
[<Project name='project1'>, Project.name='project2', ...]
```

careful about backrefs!

Flask-SQLAlchemy lets you set a default query class for all things

Uses for Context

Current User

User from Auth

```
def load_user_from_request():
    user_id = session.get('user_id')
    if user_id is not None:
        return User.query.get(user_id)
    return None


def get_current_user():
    rv = getattr(g, 'current_user', None)
    if rv is None:
        rv = g.current_user = load_user_from_request()
    return rv
```

User Access Scope Restrictions

User Scope & Request Scope

```python
def get_current_scopes():
    current_user = get_current_user()
    if current_user is None:
        all_scopes = set(['anonymous'])
    else:
        all_scopes = current_user.get_roles()
    return all_scopes & scopes_from_request_authorization()
```

Audit Logs

Log Security Related Actions

```
def log(action, message=None):
    data = {
        'action': action,
        'timestamp': datetime.utcnow()
    }
    if message is not None:
        data['message'] = message
    if request:
        data['ip'] = request.remote_addr
    user = get_current_user()
    if user is not None:
        data['user'] = User
    db.session.add(LogMessage(**data))
```

i18n / l10n

Language from User or Request

```
def get_current_language():
    user = get_current_user()
    if user is not None:
        return user.language
    if request and request.accept_languages:
        return request.accept_languages[0]
    return 'en_US'
```

Design as you go

Build first, then evolve

Sentry is still non sharded Postgres

Python helps with

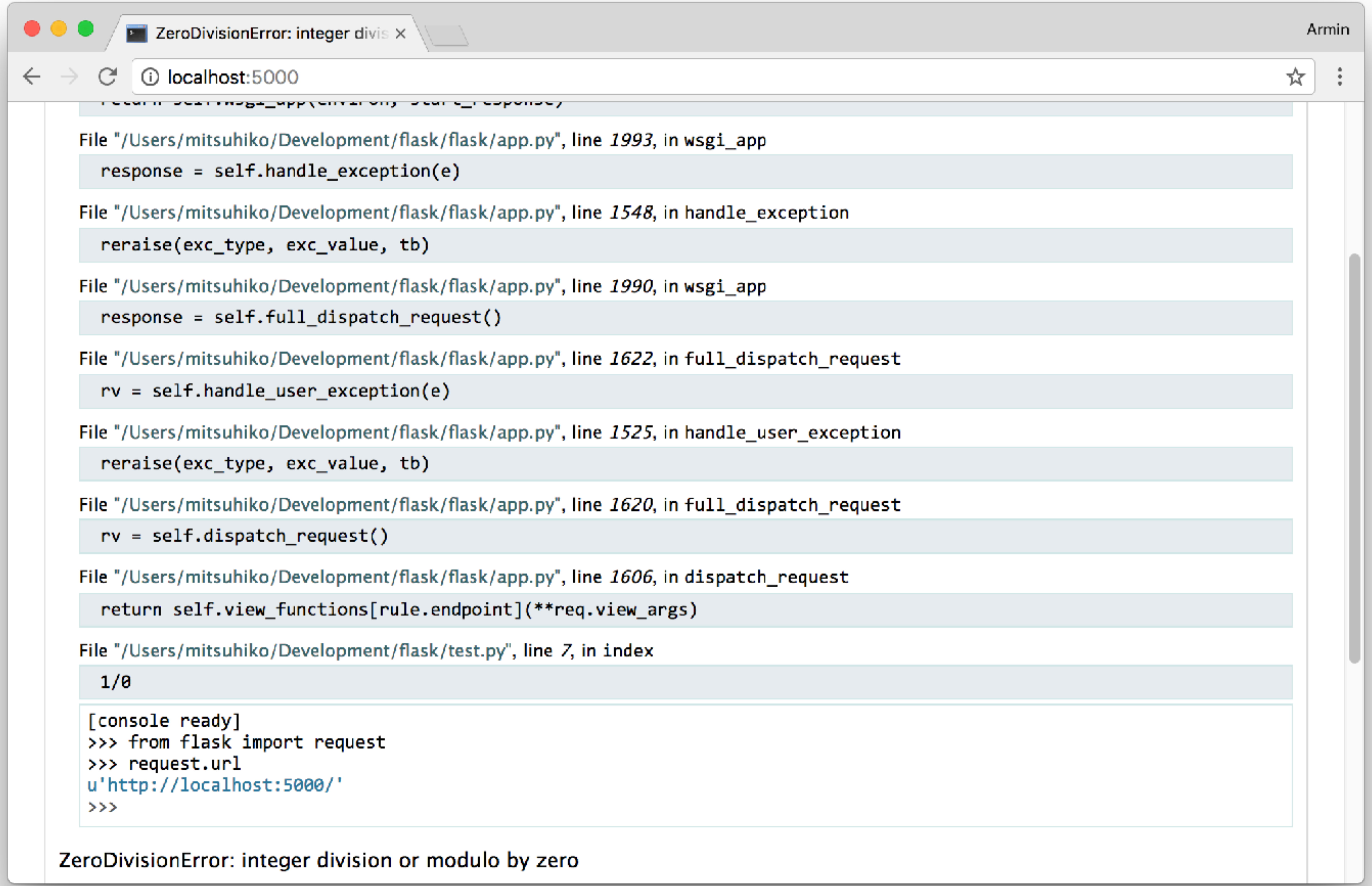
Prototype to Production

Operating Python

CPython: **Refcounting**

PyPy: **GC**

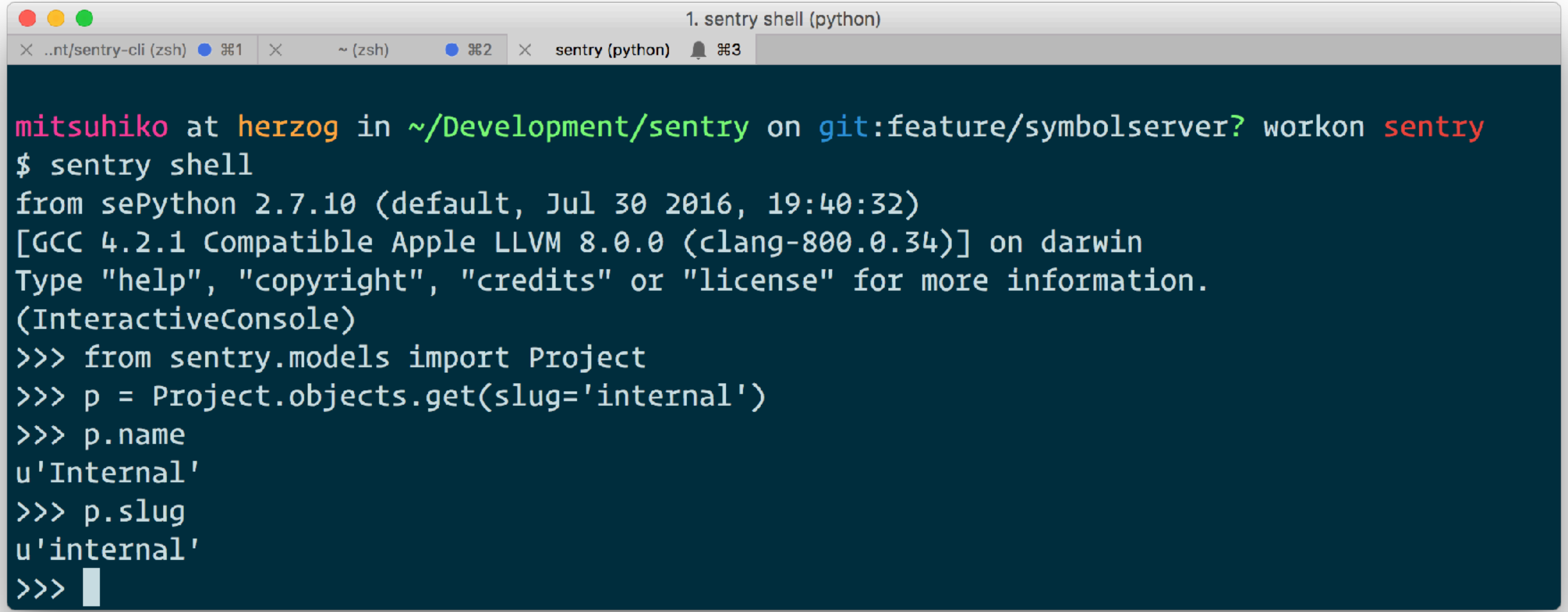
```
sys._getframe()
```



```
return self.wsgi_app(environ, start_response)
File "/Users/mitsuhiko/Development/flask/flask/app.py", line 1993, in wsgi_app
  response = self.handle_exception(e)
File "/Users/mitsuhiko/Development/flask/flask/app.py", line 1548, in handle_exception
  reraise(exc_type, exc_value, tb)
File "/Users/mitsuhiko/Development/flask/flask/app.py", line 1990, in wsgi_app
  response = self.full_dispatch_request()
File "/Users/mitsuhiko/Development/flask/flask/app.py", line 1622, in full_dispatch_request
  rv = self.handle_user_exception(e)
File "/Users/mitsuhiko/Development/flask/flask/app.py", line 1525, in handle_user_exception
  reraise(exc_type, exc_value, tb)
File "/Users/mitsuhiko/Development/flask/flask/app.py", line 1620, in full_dispatch_request
  rv = self.dispatch_request()
File "/Users/mitsuhiko/Development/flask/flask/app.py", line 1606, in dispatch_request
  return self.view_functions[rule.endpoint](**req.view_args)
File "/Users/mitsuhiko/Development/flask/test.py", line 7, in index
  1/0
```

```
[console ready]
>>> from flask import request
>>> request.url
u'http://localhost:5000/'
>>>
```

ZeroDivisionError: integer division or modulo by zero



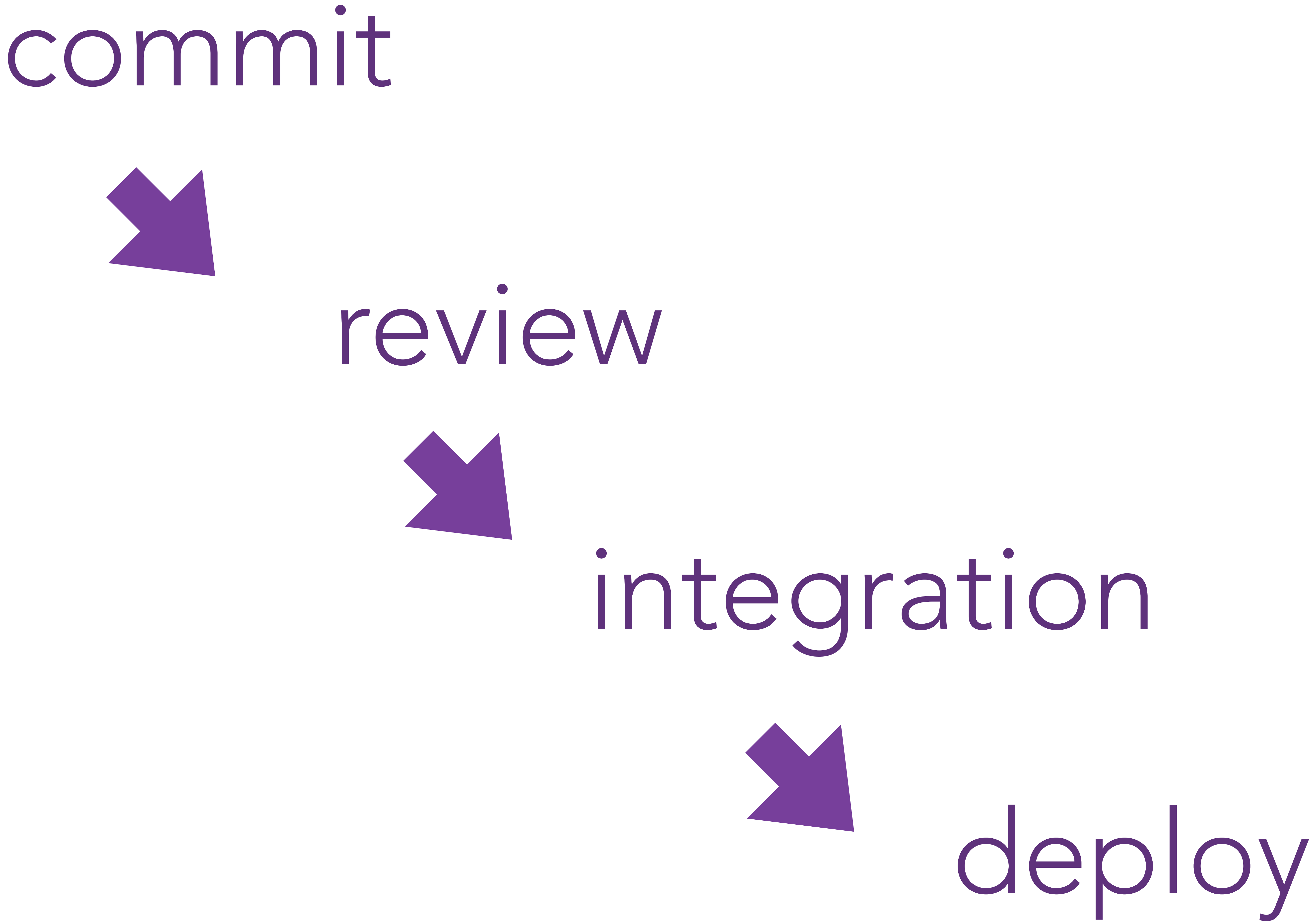
```
mitsuhiko at herzog in ~/Development/sentry on git:feature/symbolserver? workon sentry
$ sentry shell
from sePython 2.7.10 (default, Jul 30 2016, 19:40:32)
[GCC 4.2.1 Compatible Apple LLVM 8.0.0 (clang-800.0.34)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
(InteractiveConsole)
>>> from sentry.models import Project
>>> p = Project.objects.get(slug='internal')
>>> p.name
u'Internal'
>>> p.slug
u'internal'
>>> 
```

Process and Data

deploy in seconds

be unable to screw up

and if you do: instant rollbacks



commit

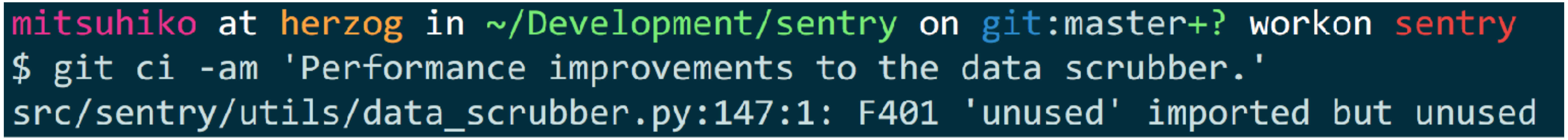
review

integration

deploy

requires good test coverage
requires good local setup
makes it easier for newcomers

lint on commit!



```
mitsuhiko at herzog in ~/Development/sentry on git:master+? workon sentry
$ git ci -am 'Performance improvements to the data scrubber.'
src/sentry/utils/data_scrubber.py:147:1: F401 'unused' imported but unused
```

FLAKE8 & CUSTOM LINTERS

master is stable

(HOW TO)

AVOID DOWNTIME

bidirectional compatibility

My Opinion: Invest into Fast Iteration rather than Scalability

Duck-Typing Helps Here

Quick Release Cycles

large systems
are organisms

not all things
run the same code
at the same time

BREAK UP FEATURES

FEATURE FLAG THEM

Make Prod & Dev Look Alike

On Prem?

TWO RELEASE CYCLES

HOURLY SAAS

SIX-WEEK ON-PREM

CONSIDER SHIPPING WIP

FEATURE FLAG IT AWAY

Feature Class

```python
class Feature(object):
   def __init__(self, key, scope, enable_chance=None, default=False):
        self.key = key
        self.scope = scope
        self.enable_chance = enable_chance
        self.default = default
    def evaluate(self):
        scope = self.scope(self)
        value = load_feature_flag_from_db(self.key, scope)
        if value is not None:
            return value
        if self.enable_chance:
            if hash_value(scope) / float(MAX_HASH) > self.enable_chance:
                return True
        return self.default
```

Random Features

```python
def ip_scope(feature):
    if request:
        return 'ip:%s' % request.remote_addr


NEW_SIGN_IN_FLOW = Feature(
    key='new-sign-in-flow',
    scope=ip_scope,
    enable_chance=0.9,
    allow_overrides='admin',
    default=False,
)
```

User Features

```
def new_dashboard_default():
    tenant = get_current_tenant()
    if tenant.creation_date > datetime(2017, 1, 1):
        return True
    return False


NEW_DASHBOARD = Feature(
    key='new-dashboard',
    scope=user_scope,
    allow_overrides='user',
    default=new_dashboard_default,
)
```

Testing Features

```
if is_enabled(NEW_DASHBOARD):
    ...
```

- Cache
- Prefetch
- Easier Grepping

Mastering Deployments

Build Wheels

then follow up with

Docker Images

Q&A